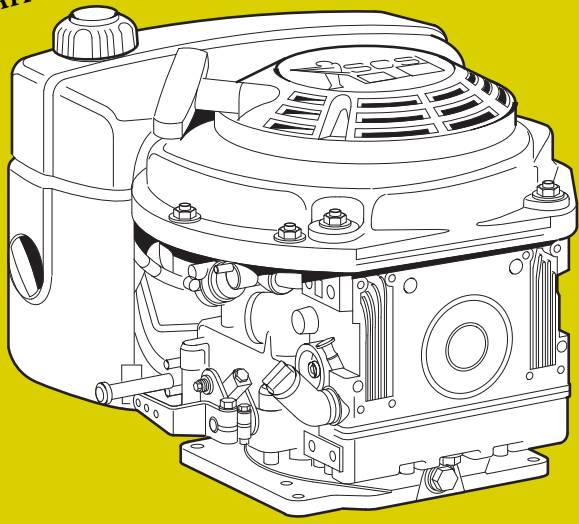
INSTRUCTION BOOK

HATZ DIESEL

INCLUDES SUPPLEMENTAL INFORMATION TO THE OWNER'S MANUAL FOR 2008 AND LATER EPA CERTIFIED NONROAD COMPRESSION-IGNITION ENGINES

INCLUDES SUPPLEMENTAL INFORMATION TO THE OWNER'S MANUAL FOR 2008 AND LATER CALIFORNIA REGULATIONS FOR HEAVY-DUTY OFF-ROAD ENGINES



1B30V
1B40V
1B40W
1B50V
1B50W

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33

A new HATZ Diesel engine - working for you

This engine is intended only for the purpose determined and tested by the manufacturer of the equipment in which it is installed. Using it in any other manner contravenes the intended purpose. For danger and damage due to this, Motorenfabrik HATZ assumes no liability. The risk is with the user only.
Use of this engine in the intended manner presupposes compliance with the maintenance and repair instructions laid down for it. Noncompliance leads to engine breakdown.

Please do not fail to read this operating manual before starting the engine. This will help you to avoid accidents, ensure that you operate the engine correctly and assist you in complying with the maintenance intervals in order to ensure long-lasting, reliable performance.

Please follow all maintenance references carefully including the schedule for 2008 and later EPA certified nonroad compression-ignition engines and for 2008 and later CARB certified off-road engines to prevent our environment.

Please pass this Instruction Manual on to the next user or to the following engine owner.

The worldwide HATZ Service Network is at your disposal to advise you, supply with spare parts and undertake servicing work.
You will find the address of your nearest HATZ service station in the enclosed list.

Original - Ersatzteile
Original-spare parts
Pièces de rechange d'origine
Repuestos originales

Use only original spare parts from HATZ. Only these parts guarantee a perfect dimensional stability and quality. The order numbers can be found in the enclosed spare parts list. Please note the spare part kits shown in Table M00.

We reserve the right to make modifications in the course of technical progress.

MOTORENFABRIK HATZ GMBH & CO KG

Contents

This symbol identifies important safety precautions.
Please comply with these most carefully in order to avoid any risk of injury to persons or damage to materials.
General legal requirements and safety regulations issued by the competent authorities or industrial accident insurers must also be complied with.

1. Important safety notes when operating the engine

HATZ diesel engines are efficient, strong and durable. For this reason they are frequently installed on equipment used for commercial purposes.
The manufacturers of such equipment must observe any relevant equipment safety regulations when the engine forms part of an overall system.
A few general points concerning operating safety should none the less be noted.
Depending on the engine's operating and installation conditions, equipment manufacturers and their users may have to fit safety or protective devices in order to prevent improper use. Examples:

– Exhaust system components as well as the surface of the engine will naturally be hot and must not be touched while the engine is running or until it has cooled down after being stopped.

– Incorrect wiring or improper operation of the electrical system may cause sparking and must therefore be avoided.

– Provide protection against contact with rotating parts once the engine is connected to the driven equipment or machine.
HATZ protective guards are available for the belt drive of the cooling fan and alternator drive systems.

– Always observe the start-up information in the operating instructions before starting the engine: **this is particularly important when starting an engine with the recoil starter!**

– Mechanical starting devices should not be operated by children or persons deficient in physical strength.

– Check that all safety devices are in place before starting the engine.

– Ensure that operation, maintenance and repair of the engine are undertaken by suitably trained personnel only.

– Protect the starter key against unauthorised use.

– Do not run the engine in closed or badly ventilated rooms.
Do not breath in emissions – danger of poisoning!

– Also fuel and lubricants could contain poisonous components. Please follow the instructions of the mineral oil producer.

Important safety notes when operating the engine

– The engine must be stopped before performing any maintenance, cleaning- or repair work.

– Stop the engine before refilling the fuel tank.
Never refuel near a naked flame or sparks which could start a fire. Don't smoke. Don't spill fuel.

– Keep explosive materials as well as flammable materials away from the engine because the exhaust gets very hot during operation.

– Wear close-fitting clothing when working on the engine while it is running.
Please don't wear necklaces, bracelets or any other things which you could get caught with.

– Please pay attention to all advice- and warning stickers placed on the engine and keep them in legible condition. Contact your next **HATZ service station**, if a sticker comes off or is illegible and ask for a new one.

– We accept no liability for damage resulting from improper modifications to the engine.

Regular servicing in accordance with the details provided in this Instruction Book is essential to keep the operating reliably and to ensure the exhaust quality of the engine.

When in doubt, consult your local **HATZ service station** before starting the engine.

2. Description of the engine

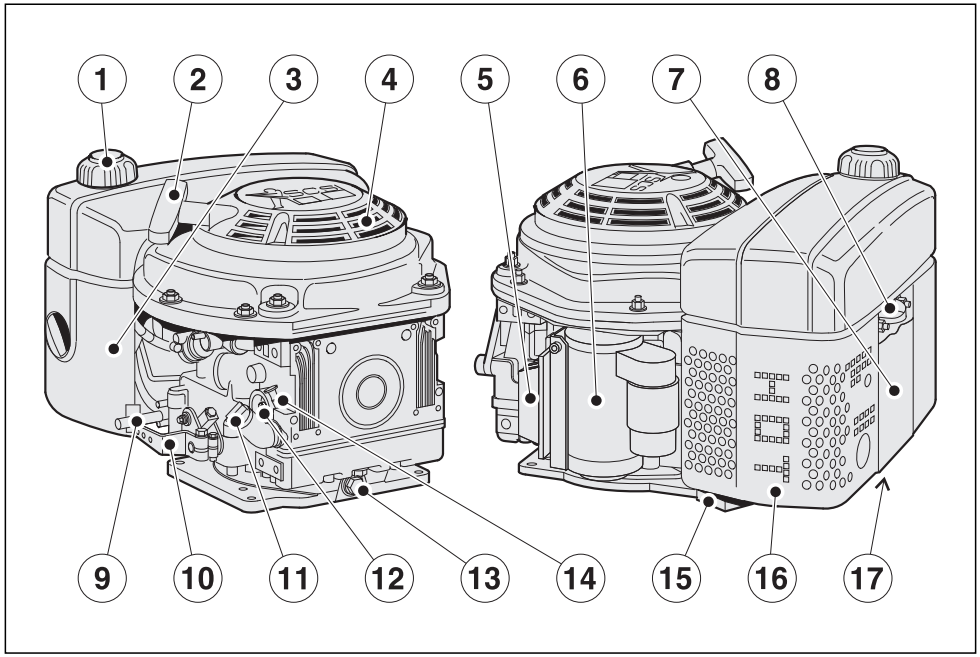


Fig 1

1 Fuel tank cap
2 Recoil starter
3 Dry-type air cleaner
4 Intake opening for cooling and combustion air
5 Voltage regulator
6 Starter motor
7 Noise insulating hood
8 Lifting lug
9 Engine shutdown pin
10 Speed control lever
11 Oil filler pipe
12 Oil filter
13 Oil drain plug
14 Dipstick
15 Exhaust mesh insert
16 Exhaust silencer
17 Type plate

3. General notes

3.1. Technical data

Type		1B30 V	1B40 V/W	1B50 V/W
Design		Air-cooled four-stroke diesel engine		
Combustion system		Direct injection		
Number of cylinders		1	1	1
Bore / stroke	mm	80 / 69	88 / 76	93 / 76
Displacement	cm^3	347	462	517
Lubricating oil capacity	l, approx.	1.1 [1]	1.5 [1]	1.5 [1]
Difference between „max." and „min" levels	l, approx.	0.5 [1]	0.8 [1]	0.8 [1]
Lubricating oil consumption after a running-in period	max.	1 % of fuel consumption at full load		
Lubricating oil pressure (oil temperature 100 °C)	approx.	2.5 bar at 3000 r.p.m.		
Direction of rotation, power take-off end		counterclockwise		
Valve clearance 10 - 30 °C Inlet and exhaust valve	mm	0.10	0.10	0.10
		or automatically [2]		
Max. angle from vertical in any direction (continuous operation)		25° [3]		
Weight (incl. fuel tank, air-cleaner, exhaust silencer, recoil starter and electric starter)	kg approx.	42	1B40 V : 55 1B40 W: 57	1B50 V : 56 1B50 W: 58
Battery capacity	max.	12 V / 60 Amp/h		

[1] These values are intended as an approximate guide. The **max.** marking on the dipstick is the determining factor, Fig. 7.

[2] Depending on model (see maintenance charts, chapter 5.1)

[3] Exceeding these limits causes engine breakdown.

Tightening torques

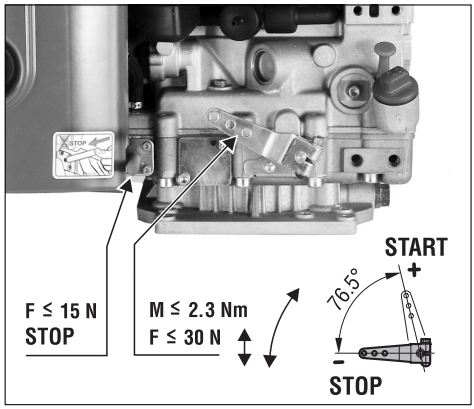
Item	Nm
Oil drain plug	50

3.2. Transport

⚠ Standard lifting lug „8“ is to allow the engine and its auxiliaries to be transported safely, chap. 2. It is not suitable or approved for lifting the complete equipment to which the engine is attached.

3.3. Notes on installation

The „Guide to selecting and installing an engine“ contains all the necessary information on engine applications if you have an engine which has not yet been installed in equipment and still has to be fitted or set up.
This guide is available from your local HATZ service station.



2

⚠ The permitted loads and elements on the speed adjusting lever and the engine shutdown pin should be observed as an excess can lead to damage to the contacts and inner governor parts.

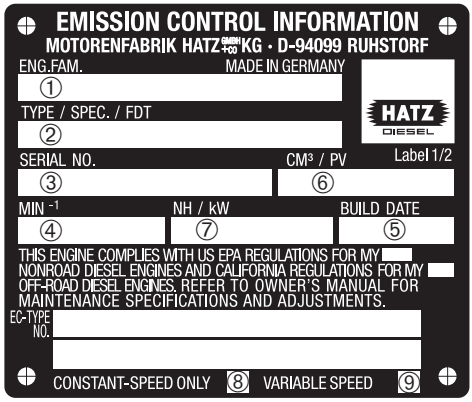
3.4. Load on engine

See supplemental information for EPA certified engines, Page 35; resp. supplemental information for California regulations for off road engines, Page 45.

3.5. EPA/CARB-type plates and fuel label

There are two EPA/CARB- type plates applied for the identification of the engine. The type plates are placed on the noise insulating hood (chapt. 2).
They include the following emission control information (Figure 3a):

Label 1/2



3a

① EPA/CARB-Engine Family Number
② engine type/spec. (only for special equipment) /Fuel Delivery Timing
③ engine number
(also stamped on crankcase, Fig.4)
④ max. engine rated speed
⑤ build date
⑥ displacement
⑦ rated power
⑧ “constant speed only” (if requested)
⑨ “variable speed” (if requested)

Every engine is equipped with an additional loose engine type plate. If the original type plate on the engine is not readily visible after the engine is installed in the equipment then the second loose type plate must be attached on the equipment in such a manner that it is readily visible to an average person.

The layout is identical for constant-speed and variable speed application.

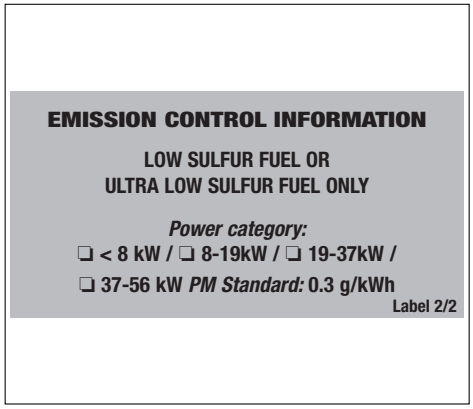
For any offer as well as spare parts orders it is necessary to mention the following data (also see spare parts list, page 1):

② engine type/spec.
(only for special equipment)
③ engine number
④ max. engine rated speed

Attention:
If the engine was certified for constant-speed application and shall be used so, the field “constant-speed only” is marked with “X”.
If the engine was certified for variable speed application and shall be used so, the field “variable speed” is marked with “X”.

Always install the engine for its intended application in order to comply with EPA and CARB emission regulation requirements.

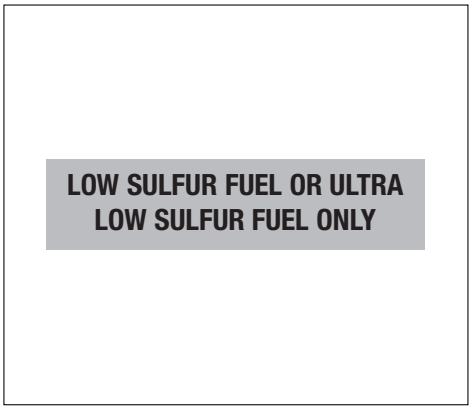
Label 2/2



3b

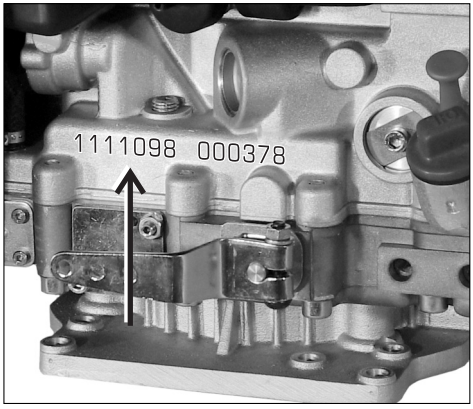
The engine must be operated with “LOW SULFUR FUEL OR ULTRA LOW SULFUR FUEL ONLY”.
The label also states the applicable emission-related power category of the engine.

Fuel label



3c

The fuel label is placed nearby the fuel inlet.
If there was no fuel tank mounted to the engine, the label has to be permanently attached to the equipment near the fuel inlet.



4

Engine serial number on crankcase.

3.6. EMISSION-RELATED INSTALLATION INSTRUCTIONS

See supplemental information for EPA certified engines, Page 35; resp. supplemental information for California regulations for off road engines, Page 45.

3.7. Closed crankcase ventilation system

Please note that the engine has a closed crankcase ventilation system.
Exceeding the maximum admissible tilt angle (see chapter 3.1. Technical data) can cause damage to the engine.
In cases where the maximum angle is exceeded, the engine must be stopped immediately.
Before restarting, the engine must be in a horizontal position and the air filter and inlet manifold must be checked for any oil contamination.
If there are any oil contamination, please consult your nearest **HATZ service station**.

4. Operation

4.1. Before starting up for the first time

Engines are normally supplied dry, i.e. not containing fuel or oil.

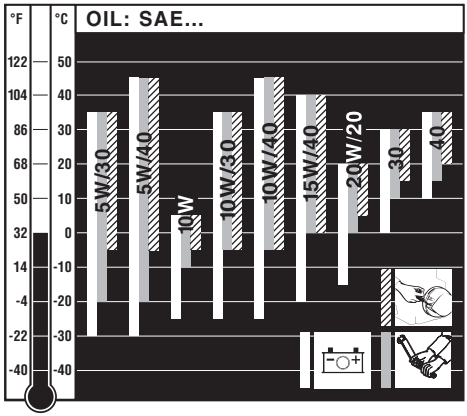
4.1.1. Engine oil

Oil quality
Qualified are all trademark oils which fulfil at least one of the following specifications:

ACEA – B2 / E2 or more significant
API – CD / CE / CF / CF-4 / CG-4 or more significant.

If engine oil of a poorer quality is used, reduce oil change intervals to 150 hours of operation.

Oil viscosity



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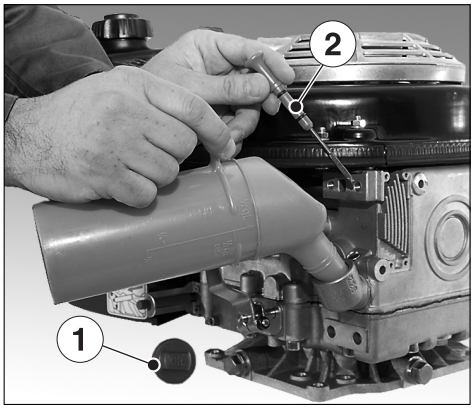
Select the viscosity class according to the ambient temperature for cold starts.

When adding oil or checking the oil level, the engine must be horizontal.



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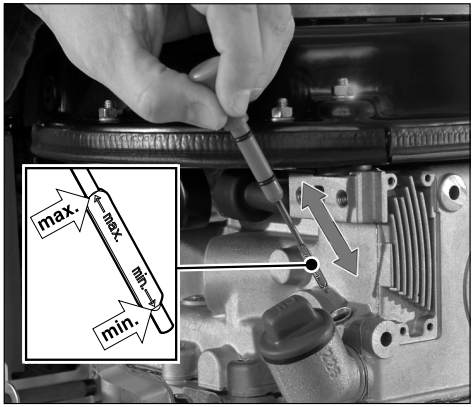
– Remove oil filler screw „1“ and dipstick „2“.



7

– Add engine oil up to the **MAX** mark on dipstick.
  Lubricating oil capacity: see Chapter 3.1.

– Insert the oil filler screw and tighten it (hand-tight only).

4.1.2. Fuel

⚠ Stop the engine before refilling the fuel tank. Never refuel near a naked flame or sparks which could start a fire.
Don’t smoke. Use only pure fuel and clean filling equipment. Take care not to spill fuel.

All diesel oils which satisfy the following specifications are suitable:

EN 590 or
BS 2869 A1 / A2 or
ASTM D 975 -1D / 2D

8

– Before the first start or if the fuel tank has been run dry, completely fill the fuel tank with diesel. The bleeding of the fuel system is automatically.

At temperatures below 0 °C, winter-grade fuel should be used or paraffin added to the fuel well in advance.

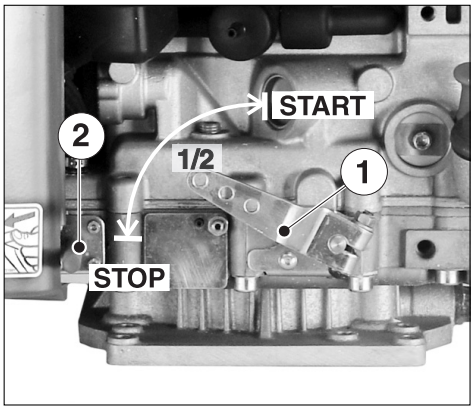
Lowest ambient temperature when starting, in °C	Paraffin content for:	
	Summer fuel	Winter fuel
0 up to –10	20 %	–
–10 up to –15	30 %	–
–15 up to –20	50 %	20 %
–20 up to –30	–	50 %

4.2. Starting

Do not run the engine in closed or badly ventilated rooms – danger of poisoning! Before starting the engine, ensure that no-one is in the danger area close to the engine or equipment, and that all protective guards are fitted.

4.2.1. Preparations for starting

If possible, disengage the engine from any driven equipment.
The auxiliary equipment should always be placed in neutral.

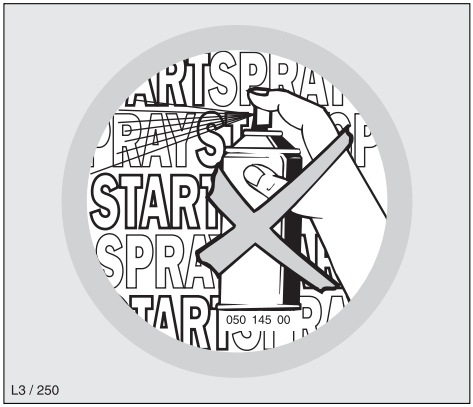


9

– Set speed control lever „1“; First of all put the lever in STOP-position and then either to 1/2 START or max. START position, as desired or necessary.
  Starting at a lower speed will help to prevent exhaust smoke.

– Now, the engine is ready for starting.

Important!
After long-time standstill (approx. 6 months or even longer) or first operation, operate engine with low adjusted speed and without load for approx. 20 sec. after start. This measure assures a lubrication of all bearings before increasing speed and load.
It also prevents an insufficient lubrication.



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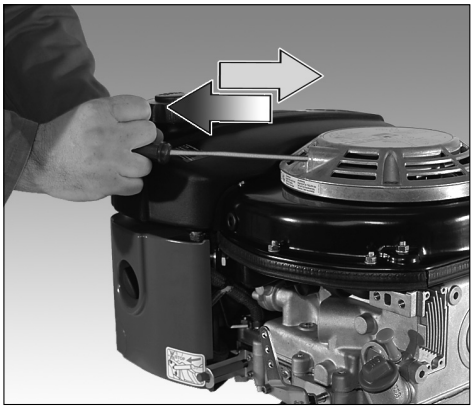
Never use starting sprays !

4.2.2. Recoil start for versions <u>without</u> electric starter (till -6 °C)

– For starting preparations, see Chapter 4.2.1.

Starting procedure



11

– Pull the starting cable out by the handle until you feel a slight resistance.

– Let the cable run back; in this way the entire length of the starting cable can be used to start the engine.

– Devices which are not securely fastened should be restrained with the foot.

12

– Grip the handle with both hands.

13

– Commence pulling the starting cable vigorously and at an increasing speed (do not jerk it violently) until the engine starts.

Note:
If after several attempts of starting the exhaust begins to emit white smoke, move the speed control lever to the STOP position and pull the starting cable out slowly 5 times. Repeat the starting procedure, Chapter 4.2.1.

4.2.3. Recoil start for versions <u>with</u> electric starter (till -6°C)

The recoil starter at engines with electric start is an emergency starting device **without** decompression automatic.
Therefore, attention has to be paid to the exact starting procedure as mentioned below.

– Prepare the engine for starting; see Chapter 4.2.1.

– Pull out the handle with the cord slowly until compression resistance is clearly felt; Fig. 11.

– Continue to pull slowly but with greater force until the resistance becomes noticeably less (compression overcome).

– Now let the cord run back - the engine is in the correct starting position.

In this way the engine can be accelerated through about one and a half revolutions with the starting cord, to overcome compression resistance and achieved the required momentum for starting.

– Support equipment with the foot if it is too light in weight or liable to tip over.

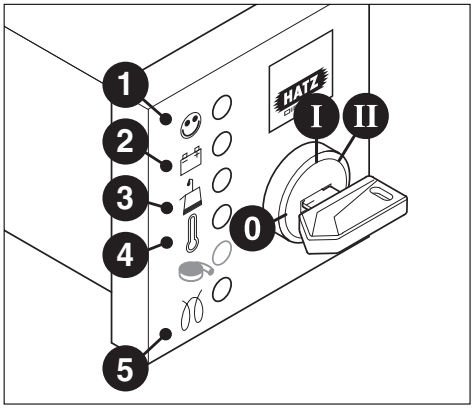
– Take hold of the handle with both hands; Fig. 12.

– Pull the starting cord up forcefully and at an increasing speed (but do not jerk it) - the engine should then start; Fig. 13.

Note:
In the case of engines with **automatic electrical shutdown system** (see next chapter), first actuate the starter switch from **position 0** to **position I**, then perform a recoil start within the following **12 seconds**. If the engine does not run after 12 seconds, this means that the electrical system blocks the fuel supply to the injection pump.
In this case, the engine cannot be started.
As a solution, turn the starter key back to **position 0**, then turn it to **position I** again. Now, start the engine within the following 12 seconds.

4.2.4. Electric starter

– For starting preparations, see Chapter 4.2.1.



14

– Insert the key **to its stop** and turn it to **position I**.

– Battery charge telltale „2“ and oil pressure warning „3“ must light up.

– Turn start key to **position II**.

– As soon as the engine runs, release the start key. It must return to **position I** by itself and remain in this position during operation.
The battery charge telltale and oil pressure warning must go out immediately after starting. Indicator light „1“ is on when the engine is in operation.

– The engine temperature display „4“ (additional equipment) lights up if the temperature at the cylinder head becomes too high.
Switch off the engine and trace and eliminate the cause of the problem, chap. 6.

– Always turn the start key back to **position 0** before re-starting the engine. The repeat lock in the ignition lock prevents the starter motor from engaging and possibly being damaged while the engine is still running.

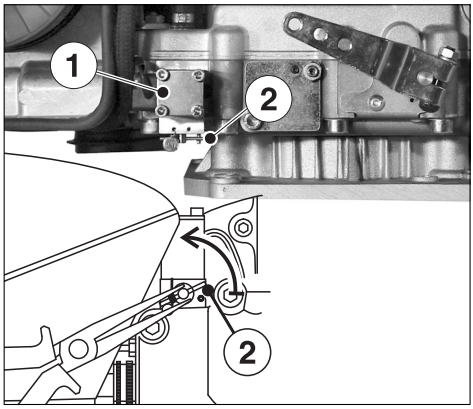
Preheating device with automatic heating timer (additional equipment)

The preheating light „5“ lights up additionally at temperatures below 0° Celsius (Fig. 14).

– After the light has gone out, start the engine without delay.

Fuel shut-off valve, stop solenoid

(additional equipment)



15

As soon as the starting key is at **Position I**, **fuel shut-off valve** „1“ is **electrically released**. The fuel feed to the injection pump is then open and the engine is ready to start.
When the engine is running, turning the starting key to **position 0 closes** the **shut-off valve** and interrupts the fuel supply to the injection pump, so that the **engine stops**; Chapter 4.3.
This shut-off valve is also used for the automatic electrical shutdown system.

Emergency start

If the **shut-off valve** is blocking the fuel supply as a result of an **electrical fault** and the **engine therefore cannot be started**, an emergency start can be attempted.
Proceed as follows for this:

– For emergency starting, turn the lever at fuel shut-off solenoid „2“ anti-clockwise by at least 90° using suitable pliers. The lead seal wire will break off.; Fig. 15.

– As soon as the emergency start lever is in the starting position, the electric starter or recoil starter can be used; Chapter 4.2.2 and 4.2.3. The oil level must always be checked before an emergency start, as insufficient oil pressure can lead to complete damage of the engine within a very short time.

After this, the engine can only be stopped with the starting key in the emergency operating mode if the emergency starting lever is first turned back **clockwise** to the stop position.

Immediately after a period of emergency running, ascertain the cause of the fault and have it rectified; Chapter 6.
Have the emergency-starting lever sealed once again by a **HATZ service point**.
When the automatic electrical shutdown system is used, the emergency start described above means that liability for risks must be accepted by the operator **(Motorenfabrik HATZ assumes no liability)!**
In case of difficulty contact the nearest **HATZ service point**.

Automatic electrical shutdown system

(additional equipment)

This is characterized by a brief flashing of all pilot lamps once the starter key has been turned to **position I** (Fig. 14).

Important!

If the engine cuts out immediately after starting or switches off by itself during operation, a monitoring element in the automatic shutdown system has tripped. The corresponding indicator light (Fig. 14, positions 2 - 4) will come on.

After the engine has stopped, the display continues to glow for about 2 minutes.

The electrical device then switches itself off automatically.

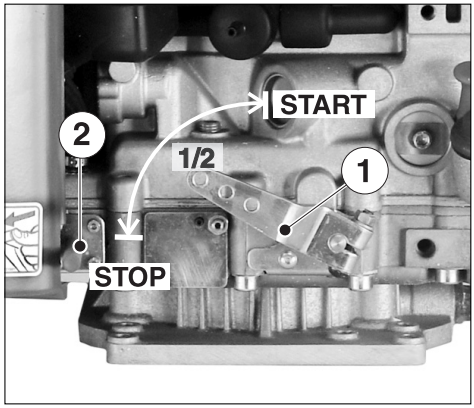
The display lights up again after the start key has been turned back to **position 0** and then to **position I** again.

Trace and eliminate the cause of the operating fault before trying to restart the engine (see chapter 6.2.).

The display light goes out when the engine is next started.

Even with automatic shutdown monitoring the oil level must be checked every 8 – 15 operating hours (Chapter 5.2.1.).

4.3. Stopping the engine



16

– Move the speed adjustment lever „1“ back to the STOP position. The engine cuts out.

Note:

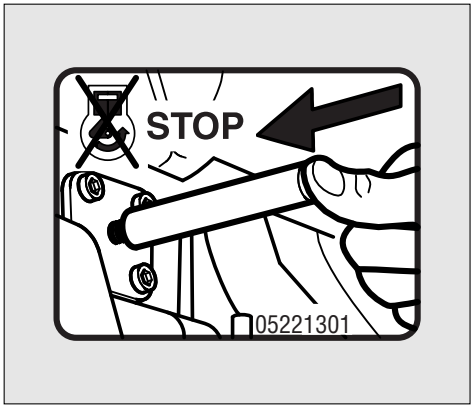
Engines with a **fixed lower idling speed** cannot be switched off using the speed adjustment lever. See the paragraph entitled „Other ways of switching off the engine“.

Other ways of switching off the engine

1. Fuel shut-off valve, stop solenoid (optional extra)

– Turn ignition key to the **0 position**. The engine cuts out, Fig. 18.

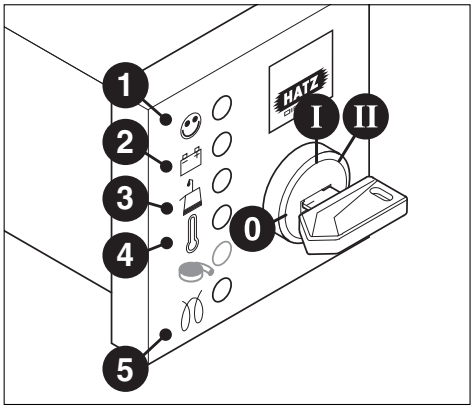
2. Stop pin (optional extra)



17

– Press the stop pin „2“ until the engine cuts out (see also Fig. 16, pos. 2).

– Once the engine has cut out, release the pin „2“ and ensure that it returns to its initial position, Fig. 16.



18

Depending upon the model, the battery charge indicator „2“ and oil pressure warning indicator „3“ will come on again after the engine comes to a stop.

– Turn the key to **position 0** and remove it. All the indicator lights must go out.

Note:
Failure to return the starter key to **position 0** may result in the battery being totally discharged.

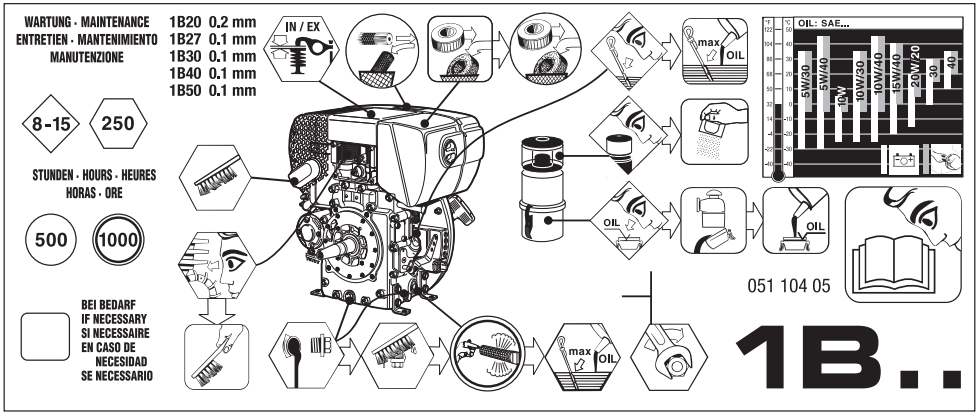
If operation of the engine is interrupted for any reason, or at the end of the working day, the starter key should be kept out of reach of unauthorised persons.

5. Maintenance

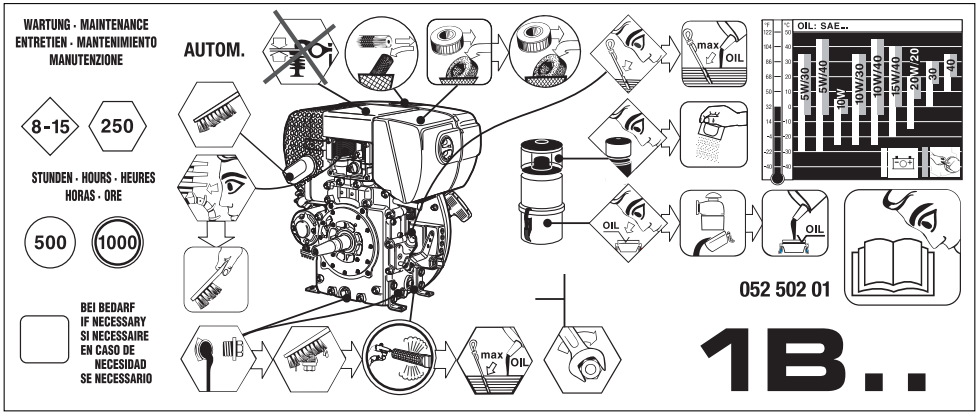
⚠ Only carry out maintenance work with the engine switched off.
Observe all relevant laws and regulations governing the handling and disposal of used oil, filters and cleaning agents.
Protect the starting key against unauthorised use.
On engines with an electric starter, disconnect the battery's negative terminal.
When maintenance work has been completed, check that all tools have been removed from the engine and all protective guards fitted again.
Before starting the engine, ensure that there are no persons in the danger area close to the engine or equipment.

5.1. Maintenance chart

	Maintenance interval	Maintenance work required	Chap.
	Every 8 – 15 operating hours, or before each daily start-up	Check oil level. Check combustion and cooling air intake zone. Check air-cleaner maintenance indicator.	5.2.1. 5.2.2. 5.2.3.
	Every 250 operating hours	Change engine oil. Check and adjust valve clearances. (Not applicable with automatic self adjusting valve clearance models, see next page) Clean cooling air area. Check screw connections. Clean mesh insert for exhaust.	5.3.1. 5.3.2. 5.3.3. 5.3.4. 5.3.5.
	Every 500 operating hours	Change fuel filter element. Dry-type air cleaner maintenance.	5.4.1. 5.4.2.
	Every 1000 operating hours	Clean the oil filter.	5.5.1.
	Once a year	Siphon water out of fuel tank.	5.6.1.



Model **without** automatic valve clearance adjustment.



Model **with** automatic valve clearance adjustment.

Depending whether the engine is equipped with or without automatic valve clearance adjustment one of the illustrated maintenance plans is included. This label should be affixed to the engine or equipment in an easily visible position. The maintenance chart governs the maintenance intervals.

On **new** or **reconditioned engines, after the first 25 operating hours**, always

– Change engine oil, Chapter 5.3.1.

– Check valve clearances and adjust if necessary, Chapter 5.3.2.

– Examine screw connections, chapter 5.3.4. **Do not tighten the cylinder head fastening.**

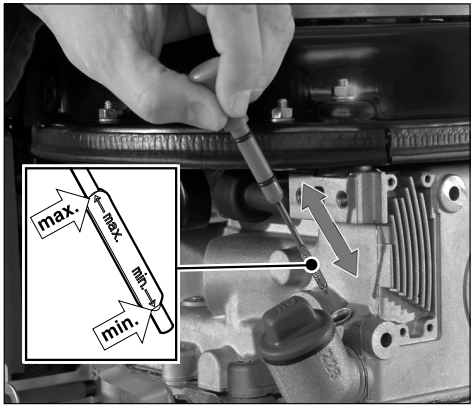
If the engine is not used frequently, change the engine oil after **12 months at the latest**, regardless of the actual number of hours it has been in operation.

5.2. Maintenance every 8 – 15 operating hours

5.2.1. Checking engine oil level

To check the oil level, the engine must be standing level and be switched off.

– Remove any dirt from the oil dipstick area.

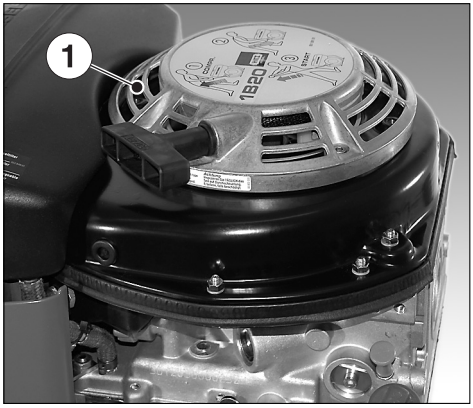


19

– Check the dipstick oil level and, if necessary, add oil to the **max.** mark, Chapter 4.1.1.

5.2.2. Check air intake area for combustion and cooling

Heavy contamination is an indication that increased dust accumulation necessitates a correspondingly shorter maintenance interval, Chapter 5.3.3. and 5.4.2.

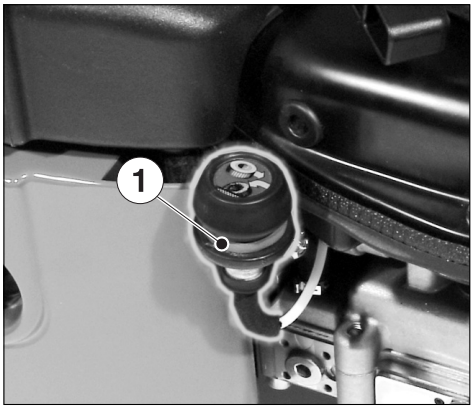


20

– Check air intake points „1“ for severe blockage due to leaves, heavy dust accumulation etc., and if necessary clean them.

5.2.3. Check air cleaner maintenance indicator (optional extra)

Mechanical service indicator



21

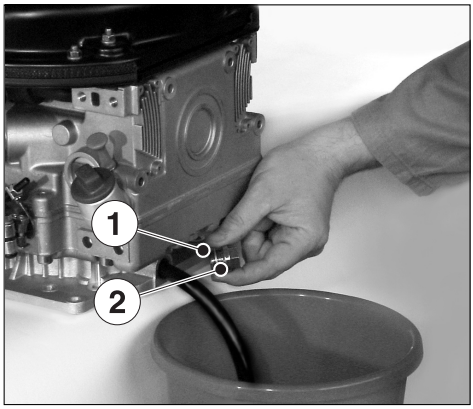
– Increase the speed of the engine briefly to the maximum. If the **rubber bellows shrinks** and covers the green area „1“, the air cleaner system should be serviced, Chapter 5.4.2.
Under dusty conditions, check the rubber bellows several times per day.

5.3. Maintenance every 250 operating hours

5.3.1. Changing engine oil

The engine must be standing level and be switched off.
Only change the oil when the engine is warm.

Danger of scalding from hot oil!
Trap the old oil and dispose of it in accordance with local legislation.



22

– Take out oil drain plug „1“ and allow the oil to drain out.

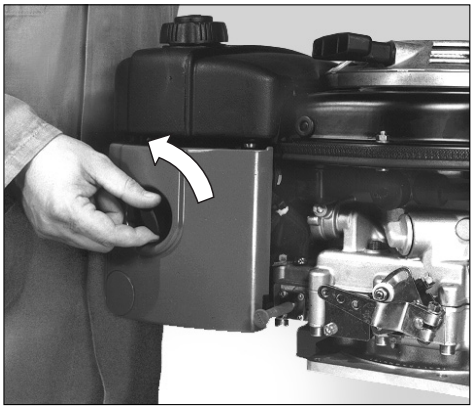
– Clean the oil drain plug „1“, fit a new washer „2“, insert and tighten.

– Add engine oil, Chapter 4.1.1.

5.3.2. Checking and adjusting valve clearances

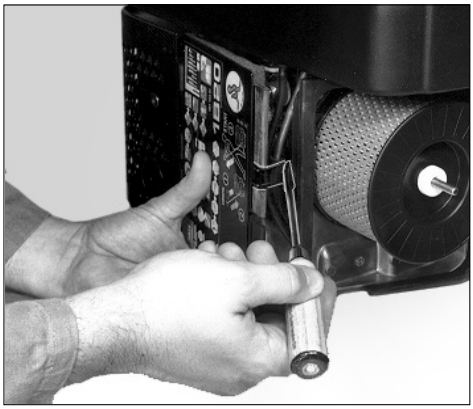
Remark:
Following steps are inapplicable in case equipment is with automatic tappet clearance compensation. Identification characteristic is maintenance plan, chapter 5.1.

Only carry out adjustments when the engine is cold (10 - 30 °C).



23

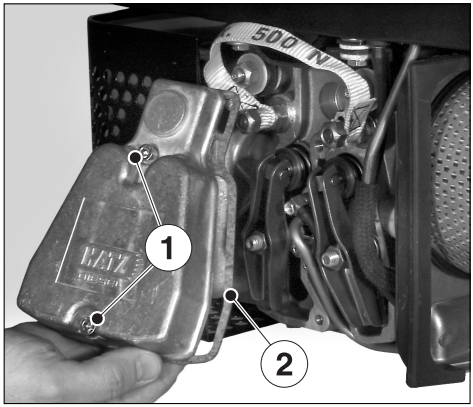
– Remove air cleaner cover.



24

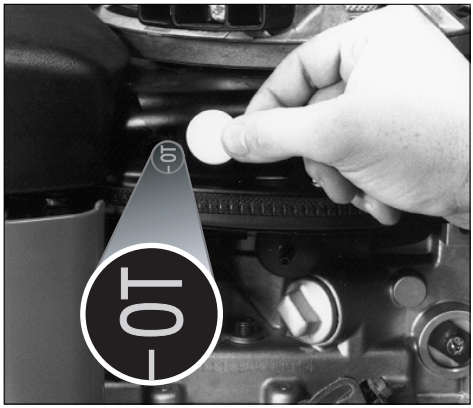
– Remove noise insulating hood.

– Remove any contamination adhering to the cover for the cylinder head.



25

– Remove screws „1“ and take off the cylinder head cover with gasket „2“.

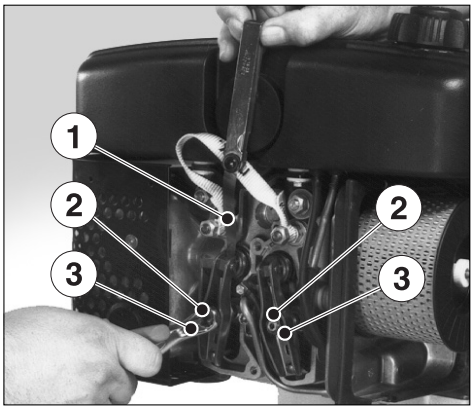


26

– Remove rubber cap from the inspection hole cover.

– Turn the engine over in the normal direction of rotation until the valves are in the overlap position (exhaust valve not yet closed, inlet valve starts to open).

– Turn the crankshaft through 360° in the normal direction of rotation and align exactly to the **OT**-marking, Figure 26.



27

– Check valve clearances with feeler gauge „1“.

– If valve clearances require adjusting, slacken off screw „2“ and turn hex nut „3“ until feeler gauge „1“ can be pulled through with just slight resistance when screw „2“ is retightened.

– Fit cover for cylinder head and tighten evenly, always using a new gasket.

– Re-attach parts previously removed from engine.
Do not forget: replace the rubber cap at the inspection hole cover.

– Carry out a brief test run, then check the cover for leaks.

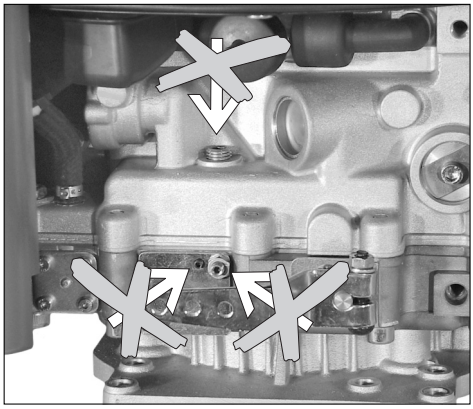
5.3.3. Cleaning the air cleaner zone

The engine must be switched off and cooled down before cleaning!

– If severely contaminated, clean the cooling fins on the cylinder and cylinder head, and also the fan blades in the flywheel. If necessary, contact your local HATZ service station.

5.3.4. Checking screw connections

– Check the tightness of all threaded connections and take up slack if necessary, provided that these can be reached during maintenance work.
Do not tighten the cylinder head bolts.

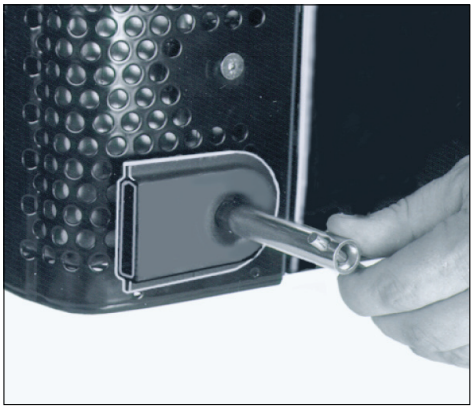


28

The adjusting screws at the engine governor and on the injection system are sealed with lacquer and are not to be tightened or adjusted.

5.3.5. Cleaning the exhaust mesh inlet

Exhaust system components will naturally be hot and must not be touched while the engine is running or until it has cooled down after being stopped.

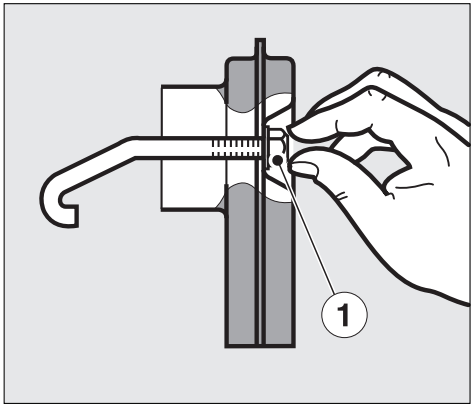


29

– Unscrew hex nut and remove the exhaust mesh insert.

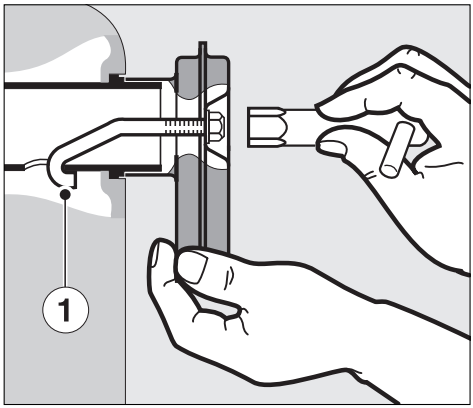
– Remove any deposits in the mesh insert by means of a wire brush.

– Check the exhaust mesh insert for cracks or damage and, if necessary replace with a new one.



30

– Screw on hexagon nut „1“ by approx. 1 turn.



31

– Insert exhaust screen with hoop „1“ into hole, them pull outwards again so that the hoop is retained.

– Tighten the hexagon nut fully.

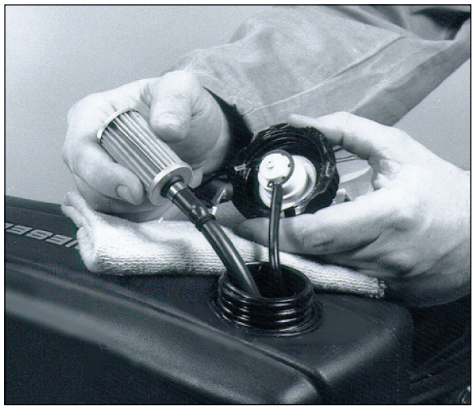
5.4. Maintenance every 500 operating hours

5.4.1. Renewing fuel filter

The maintenance intervals for the fuel pump filter are dependent upon the purity of the diesel oil being used and, if necessary, may have to be reduced to 250 hours.

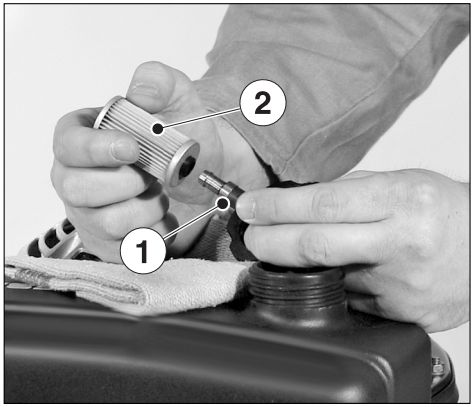
When working on the fuel system, do not expose it to naked flames; do not smoke.

Important!
Keep the entire area clean so that no dirt reaches the fuel. Fuel particles may damage the injection system.



32

– Open tank cap and pull out fuel filter from tank with cord.



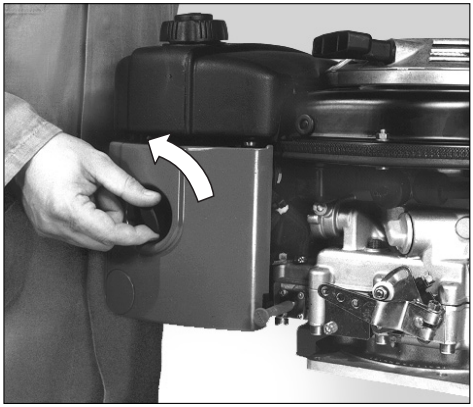
33

– Pull fuel supply line „1“ off fuel filter „2“ and insert new filter.

– Fit the fuel filter again and close the tank cap. Bleeding of the fuel injection system takes place automatically.

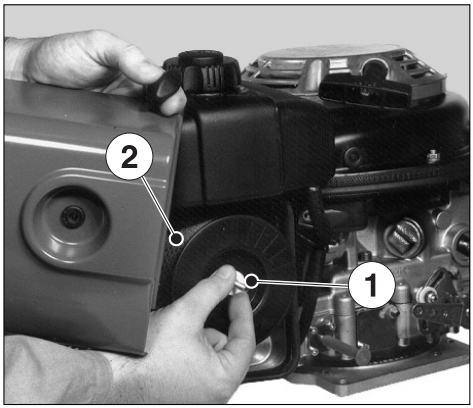
5.4.2. Air cleaner maintenance

The filter cartridge should only be cleaned when the maintenance lamp lights at maximum speed, chap. 5.2.3.
However, the filter cartridge should always be replaced after 500 operating hours at the latest.



34

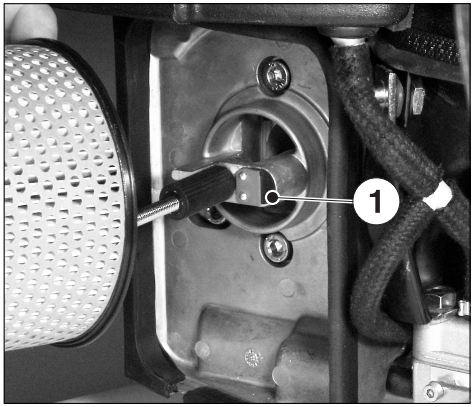
– Remove the air cleaner cover.



35

– Unscrew and remove knurled nut „1“ and take off air cleaner element „2“.

– Clean the filter compartment and the cover. Dirt and other foreign bodies must not be allowed to enter the engine’s air inlet points.



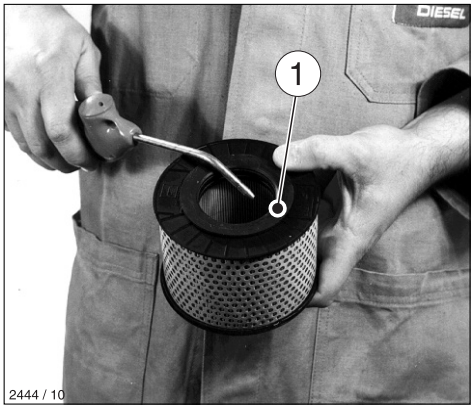
36

– On versions with a mechanical air cleaner service indicator, check the condition and cleanliness of valve plate „1“.

– The filter cartridge should either be renewed or, depending upon the degree of contamination, cleaned, or checked, as follows:

Cleaning the filter cartridge

Dry contamination



37

– Use compressed air to blow through the filter cartridge from the inside outwards, until no further dirt emerges.

Important!
The pressure must not exceed 5 bar.

Moist or oily contamination
Renew the filter cartridge.

Checking the filter cartridge

– Check filter cartridge's gasket surface „1“ for damage, Fig. 37.

– Check the filter cartridge for cracks or any other type of damage to the paper filter by holding it inclined towards the light or by shining a light source through it.

Important!
The slightest damage to the paper filter rules out it being used any longer.

– Re-assemble the filter cartridge in the reverse order of work.

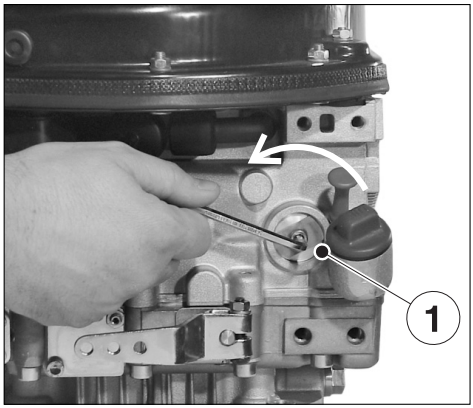
5.5. Maintenance every 1000 operating hours

5.5.1. Cleaning the oil filter

Cleaning of oil filter should be carried out together with changing engine oil.

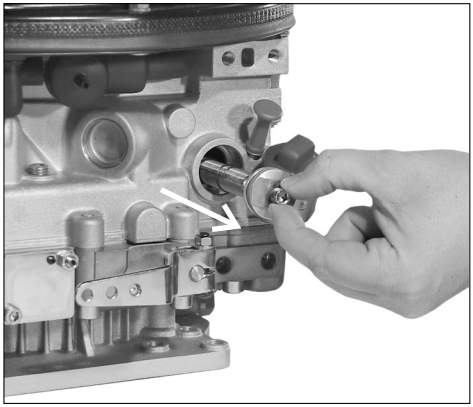
The engine must be standing level and be switched off.

Danger of scalding from hot oil! Trap the old oil and dispose of it in accordance with local legislation.



38

– Loosen screw „1“ with approx. 5 rotations.

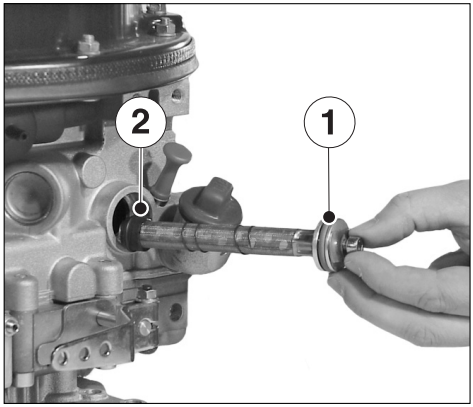


39

– Remove oil filter from housing.

40

– Use an air line to blow out oil filter dirt from the inside outwards.

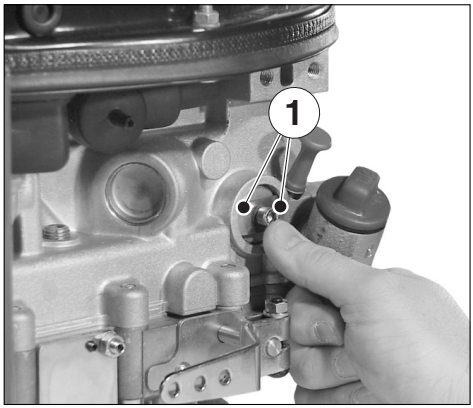


41

– Check joint washer „1“ whether it is damage; replacement if necessary.

– Check joint washer „2“ whether it is damage and correctly fitted, replace oil filter if necessary.

– Lubricate joint washer before fitting.



42

– Put in oil filter and press until limit stop.

– Check whether tension springs sit close to oil filter with both ends „1“, before tightening screw.

– Check the dipstick oil level and, if necessary, add oil to the **max.** mark, Chapter 4.1.1.

5.6. Servicing: once a year

5.6.1. Draining the fuel tank

When working on the fuel system, do not expose it to a naked flame; do not smoke.

– Condensation forms due to temperature variations at the lowest points of the fuel tank.

The condensate must therefore be removed once a year as follows:

43

– Fit a polyethylene tube (diameter 4 mm, length approx. 350 mm) to a commercial syringe (20 ml or larger).

44

– Run the tube down to the bottom of the tank and drain off the diesel oil/water mixture. The specific gravity of water is heavier than that of diesel oil and therefore a distinct dividing line should be visible.

– Repeat the procedure several times until the transparent syringe is full of diesel oil only.

6. Malfunctions – causes and remedies

Malfunctions	Possible causes	Remedy	Chap.
6.1. Engine does not start, or not immediately, but can be turned over easily as usual.	Speed control lever in stop or idle position.	Move lever to START position.	4.2.1.
	Engine shutdown pin in STOP position.	Move to operating position by pulling the pin gently.	4.3.
	No fuel in the injection pump.	Add fuel.	4.1.2.
		Systematically check the entire fuel supply system: If still no fault found,	
		- check engine feed line	
		- check fuel filter	5.4.1.
	Insufficient compression:		
	- Incorrect valve clearance.	Check valve clearances, adjustif necessary.	5.3.2.
	- Cylinders and/or piston rings worn.	See workshop manual.	
	Injector not functioning.	See workshop manual.	
At low temperatures.	Below starting threshold temperature.	Operate preheater (optional extra).	4.2.4.
	Equipment not disengaged.	Disengage engine from equipment, if possible.	
	Preheating system faulty (optional extra).	See workshop manual.	
	Fuel has inadequate resistance to low temperatures.	Check whether clear (not turbid) fuel emerges at the fuel line detached from the injection pump. If turbid or separated - either warm up the engine or drain the complete fuel supply system. Refill with winter-grade fuel to which paraffin has been added.	4.1.2.

Malfunctions	Possible causes	Remedy	Chap.
At low temperatures	Starting speed below 400 rpm: - Viscosity of oil too high.	Change lubricating oil and add oil of the correct viscosity class.	5.3.1. 4.1.1.
	- Battery charge too low.	Check the battery, if necessary contact a service station.	7.
If equipped with a stop solenoid or automatic electrical shutdown system (additional equipment)	Solenoid faulty and/or fault in the electrical system.	See workshop manual.	
6.2. Engine fires but does not run.	Speed control lever not moved far enough towards „START“.	Move lever to „START“ position.	4.2.1.
	Equipment not disengaged.	Disengage engine from equipment if possible.	
	Fuel filter blocked.	Renew fuel filter.	5.4.1.
With automatic shutdown (optional extra)	One of the automatic shutdown's monitoring elements has initiated a stop signal. (See also Chapter 6.4.).	Localise the monitoring element responsible and clear the fault, or contact a HATZ service station.	
6.3. Starter motor does not operate or engine does not turn over.	Fault in the electrical system: - Battery and/or other cables incorrectly connected up. - Cable connections loose and/or oxidised. - Battery faulty and/or flat. - Starter motor faulty. - Faulty relays, monitoring element.	Check electrical system and its component. See also the workshop manual.	7.

Malfunctions	Possible causes	Remedy	Chap.
6.4. Engine cuts out of its own accord during operation.	Fuel supply interrupted - Tank has run empty. - Fuel filter blocked. - Aeration outlet restricted at fuel tank seal. - Air in the fuel system.	 Add fuel. Change fuel filter. Ensure adequte tank venting. Check fuel system for penetration of air. Check air vent valve.	 4.1.2. 5.4.1.
	Mechanical faults.	Contact a HATZ service station.	
With automatic electrical shut-down installed (optional extra)	One of the automatic shut-down's monitoring elements has initiated a stop signal.	Localise the monitoring element responsible and clear the fault, or contact a HATZ service station.	
	Monitoring element for: - oil pressure too low - engine temperature too high - defective alternator.	 Check oil lubrication. Check air cooling zone for contamination. See workshop manual.	 5.2.1. 5.3.3.
6.5. Engine output and speed both drop.	Fuel supply interrupted: - Tank has run empty. - Fuel filter blocked. - Aeration outlet restricted at fuel tank seal. - Air in the fuel system. - Speed control lever does not remain in desired position.	 Add fuel. Change fuel filter. Provide adequate tank breathing. Check fuel system for penetration of air. Check air vent valve. Lock the lever into position.	 4.1.2. 5.4.1.

Malfunctions	Possible causes	Remedy	Chap.
6.6. Engine output and speed fall, black smoke from exhaust.	Air cleaner contaminated.	Clean or renew the air cleaner.	5.4.2.
	Valve clearances incorrect.	Adjust valve clearances.	5.3.2.
	Injector not functioning.	See workshop manual.	
6.7. Engine becomes very hot. Indicator lamp for cylinder temperature (optional extra) comes on.	Too much lubricating oil in engine.	Drain off lubricating oil as far as upper mark on dipstick.	5.3.1.
	Inadequate cooling: - Contamination of entire cooling air zone.	Clean cooling air zone.	5.3.3.
	- Air duct panels not properly sealed.	Check cooling air deflector plates and shafts for completeness and airtight seal.	
6.8. Condensate outlet from exhaust box.	Operation over a longer period without load.	Run engine with a load of 70% until the exhaust box gets dry again.	

7. Work on the electrical system

Batteries generate explosive gases. Keep them away from naked flame and sparks which could cause them to ignite. Do not smoke.
Protect eyes, skin and cloth against the corrosive battery acid. Pour clear water over acid splashes immediately. In case of emergency call doctor.

Do not place any tools on top of the battery. Always disconnect the negative (–) pole of the battery before working on the electric device.

– Do not confuse the **positive (+)** and **negative (–)** terminals of the battery.

– When **fitting** the battery, first connect up the **positive lead**, then the **negative lead**. **Negative terminal to earth = engine block.**

– When **removing**, first disconnect the **negative lead,** then the **positive lead.**

– Always take care to **avoid short-circuits** and earth (ground) contact of live cables.

– If malfunctions occur, first of all **check** that **cable connections** make good contact.

– Replace a failed indicator light without delay.

– **Do not remove the ignition key** while the engine is running.

– **Do not disconnect the battery** while the engine is running. Electric voltage peaks can cause damage to electrical components.

– In case of an **emergency start in manual mode**, leave the battery (which might be discharged) connected to the engine.

– For **emergency operation without battery**, make sure that the plug-and-socket connector to the instrument box is disconnected additionally before the engine is started.

– Do not splash electrical device with water jet or pressure jet during engine cleaning.

– When carrying out **welding work** on the engine or equipment, fit the earth clip of the welding equipment as close to the welding point as possible and **disconnect the battery**. The connecting plug for the voltage regulator must be removed.

The relevant circuit diagrams are enclosed with the engine if it is equipped with an electrical system. Additional circuit diagrams can be supplied to order.

HATZ assumes no liability for electrical systems which was not carried out acc. HATZ circuit diagrams.

8. Storage out of use

The new engine can normally be stored dry for up to one year.
In very humid climates or coastal regions, the protective treatment is sufficient for up to about 6 months.
For longer periods of storage, please contact your nearest **HATZ service station**.

SUPPLEMENTAL INFORMATION
TO THE OWNER'S MANUAL FOR 2008 AND LATER
EPA CERTIFIED
NONROAD COMPRESSION IGNITION ENGINES.

EPA EMISSION CONTROL SUPPLEMENTAL
WARRANTY STATEMENT AND
EMISSION-RELATED INSTALLATION
INSTRUCTIONS.

MAINTENANCE AND WARRANTY.

SUPPLEMENTAL INFORMATION TO THE OWNERS MANUAL FOR 2008 AND LATER EPA CERTIFIED NONROAD COMPRESSION IGNITION ENGINES.

The following supplemental information is furnished for EPA Nonroad Compression Ignition Engines which are certified according to 40 CFR Part 89 and Part 1039.

This information contains the following specific items:

- EPA-related engine parts and engine operating conditions
- Maintenance instructions for EPA-related engine parts
- Emission control system and adjustments
- Warranty statement
- Emission-related installation instructions

ENGINE PARTS AND / OR EQUIPMENT RELATED TO EPA EXHAUST EMISSION REGULATIONS.

Parts which are mandatory for engine operation.

The following parts as manufactured according to HATZ specifications are mandatory for engine operation which meets EPA exhaust emission regulations.

- Fuel injection pump
- Injection nozzle
- Bimetallic strip
- Crankcase breather valve assembly
- Air cleaner housing

- Oil filler cap
- Intake and exhaust gaskets at head interfaces
- Emission Control Information Labels

Only parts manufactured by Hatz and which have passed the Hatz Quality Assurance Program are assured of meeting EPA exhaust emission regulations.

UNUSUAL OPERATING CONDITIONS.

The engine must not be operated at a load factor less than 25 % for an extended period as such operation will cause the fuel injector to foul. If such a condition occurs, you should contact the nearest HATZ authorized Service Center for necessary repairs.

The engine is designed and adjusted to operate most efficiently at the following conditions:

- Air temperature of 25° C (77° F)
- Atmospheric pressure of 100 kPa (14.5 psi)
- Relative humidity of 30 %

Operation of the engine at conditions other than above will affect performance and exhaust emissions. Normally the equipment manufacturer takes this into account during the design of the machine and your equipment will perform within specifications over a wide range of climatic conditions. However if you must operate your equipment under very unusual climatic conditions, please contact your nearest Hatz distributor for advice.

MAINTENANCE SCHEDULE-EPA-RELATED PARTS

The following minimum intervals are being adopted for adjustment, cleaning, repair, or replacement of following components:

At 1,500 hours, and 1,500-hours intervals thereafter:
- Fuel injector tips (cleaning only)

At 3,000 hours, and 3,000-hours intervals thereafter:
- Fuel injector

The exhaust quality of the engines can be influenced by the execution (the quality of execution) of above described maintenance work.

Therefore, the maintenance work has to be carried out by a qualified workshop.
Hatz authorised workshops, for example, are qualified workshops.
Hatz Diesel of America will give you respective addresses, if required.

EMISSION CONTROL SYSTEM AND ADJUSTMENTS.

The emission control system for this engine is EM (Engine Modification).
No adjustments are needed or possible.

EPA EMISSION CONTROL WARRANTY STATEMENT

YOUR WARRANTY RIGHTS AND OBLIGATIONS.

Motorenfabrik Hatz GmbH & Co. KG warrants the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system includes:

- Fuel injection pump
- Injection nozzle
- Bimetallic strip
- Crankcase breather valve assembly
- Air cleaner housing
- Oil filler cap
- Intake and exhaust gaskets at head interfaces
- Emission Control Information Labels

Where a warrantable condition exists, Motorenfabrik Hatz will repair your engine at no cost to you including diagnosis, parts and labor.

MANUFACTURERS WARRANTY COVERAGE:

The 2008 and later EPA certified nonroad compression ignition engines are warranted for 1500 hours of operation or two years of use, whichever first occurs.

If any emission related part on your engine is defective, the part will be repaired or replaced by Motorenfabrik Hatz.

OWNERS WARRANTY RESPONSIBILITIES:

- As the engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. Motorenfabrik Hatz recommends that you retain all receipts covering maintenance on your engine, but Motorenfabrik Hatz cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

- As the engine owner, you should be aware, however, that Motorenfabrik Hatz may deny you warranty coverage if your engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

- You are responsible for presenting your engine to a Motorenfabrik Hatz authorized service center as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

If you have any questions regarding your warranty rights and responsibilities, you should contact HATZ DIESEL OF AMERICA, Inc. at (262) 544-0254.

HATZ DIESEL SUPPLEMENTAL WARRANTY FOR 2008 AND LATER EPA CERTIFIED ENGINES.

PARTS WITH SUPPLEMENTAL LIMITED WARRANTY.

The following limited warranty is supplemental to the standard HATZ DIESEL LIMITED ENGINE WARRANTY and covers 2008 and later EPA certified engines and applies to the following exhaust emission-related components:

- Fuel injection pump
- Injection nozzle
- Bimetallic strip
- Crankcase breather valve assembly
- Air cleaner housing
- Oil filler cap
- Intake and exhaust gaskets at head interfaces
- Emission Control Information Labels

SUPPLEMENTAL LIMITED WARRANTY.

Hatz Diesel of America, Inc. hereinafter referred to as “HATZ” warrants each of the above-listed parts when installed in a new engine sold by Hatz to be free from defects in material and workmanship under normal use and service, only under the named warranty coverage conditions, after the date of delivery to the original retail purchaser and Hatz will at their option, repair or replace at Hatz's sales headquaters, or at a point designated by Hatz, any part or parts which shall appear to the satisfaction of Hatz upon inspection at such point, to have been defective in material or workmanship.

- Any warranted part which is scheduled for replacement as required maintenance is warranted for the period of time up to the first scheduled replacement point for that part.

- Any replacement part which is equivalent in performance and durability may be used in non-warranty maintenance or repairs and will not reduce the overall engine warrranty obligations of Hatz. However, Hatz is not responsible for failure of such replacement parts or failure of any other parts directly caused by failure of such replacement parts.

- This warranty does not obligate Hatz to bear any transportation charges in connection with the repair or replacement of defective parts. This warranty is transferrable to subsequent owners, only under the named warranty coverage conditions.

- In order to obtain service under this warranty, the retail purchaser should contact Hatz Diesel of America, Inc. at (262) 544-0254 for information and the nearest service center. The retail purchaser will not be charged for diagnostic labor which leads to the determination that a warranted part is defective, nor for the repair or replacement of warranted parts if the work is performed at an authorized Hatz service center. If other engine components are damaged due to a failure of the above-listed warranted parts still under warranty, these other engine components will also be repaired or replaced at no charge.

- This warranty shall not apply to any engine which shall have been installed or operated in a manner not recommended by Hatz, nor to any engine which shall have been repaired, altered, neglected, or used in any way which, in the opinion of Hatz, adversely affects its performance, nor to any engine in which parts not authorized by Hatz have been used, which parts or the use of which have damaged or caused defects in or otherwise adversely affected the engine or its performance, nor to normal maintenance service or replacement of normal service items.

Hatz reserves the right to modify, alter, and improve any engine or parts without incurring any obligation to replace any engine or parts previously sold with such modified, altered, or improved engine or parts.

EMISSION-RELATED INSTALLATION INSTRUCTIONS

“Failing to follow these instructions when installing a certified engine in a piece of nonroad equipment violates federal law (40CFR1068.105(b)), subject to fines or other penalties as described in the Clean Air Act.”

“If you install the engine in a way that makes the engine's emission control information labels hard to read during normal engine maintenance, you must place duplicate labels on the equipment.”

EQUIPMENT-LABELLING REQUIREMENTS: FUEL LABEL (Chapter 3.5)

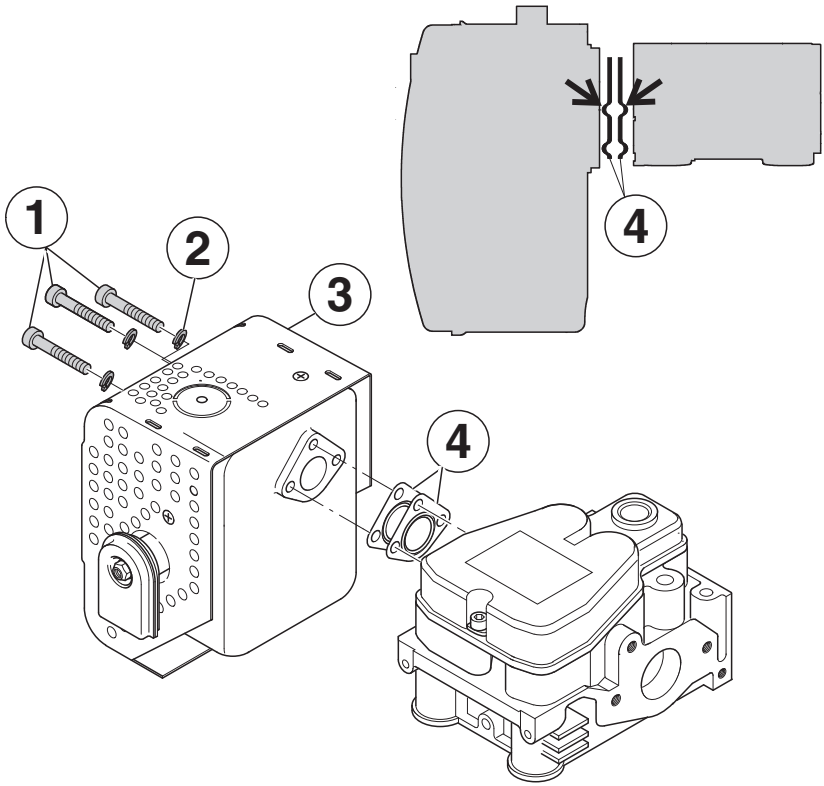
The fuel label has to be permanently attached to the equipment.
In case of an engine mounted fuel tank, every engine is equipped with an additional fuel label.
Otherwise, there are two loose fuel labels available with the engine.

If the original fuel label is not readily visible after the engine is installed in the equipment then the second loose fuel label must be attached on the equipment in such a manner that it is readily visible to an average person.

INSTRUCTIONS ON THE INSTALLATION OF THE EXHAUST SYSTEM

Following are the instructions to properly install the exhaust system and related components consistent with the EPA emission regulation requirements.

1B30 V · 1B40 V/W · 1B50 V/W



Exhaust-silencers and protection guard

The exhaust silencer is fitted in connection with flat washers.
Fixation is done by Allen screws.

Dismantling:
- Remove in numerical sequence **1...4**.

Assembly:
- Assemble in reverse sequence.

- Ensure gasket-kit is fitted in correct sequence i.e. the creased gaskets **4** face towards exhaust silencer and cylinder head.

SAMPLING OF EXHAUST EMISSIONS

After the engine is installed in the equipment and placed in service, the sampling of exhaust emissions can be performed in a way that prevents diluting the exhaust sample with ambient air as follows:

- Remove the exhaust mesh insert, if so fitted, as described in chapter 5.3.5.

- The sampling probe for measuring the emissions can be put into the exhaust silencer outlet. There are no additional pipes or clamps needed for measuring the undiluted exhaust sample.

SUPPLEMENTAL INFORMATION TO THE OWNER´S MANUAL FOR 2008 AND LATER CALIFORNIA REGULATIONS FOR HEAVY-DUTY OFF-ROAD ENGINES

CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT AND EMISSION-RELATED INSTALLATION INSTRUCTIONS.

MAINTENANCE AND WARRANTY.

SUPPLEMENTAL INFORMATION TO THE OWNER´S MANUAL FOR 2008 AND LATER CALIFORNIA REGULATIONS FOR HEAVY-DUTY OFF-ROAD ENGINES.

The following supplemental information is furnished for California Heavy-Duty Off-Road Engines.

This information contains the following specific items:

- CARB-related engine parts and engine operating conditions
- Maintenance instructions for CARB-related engine parts
- Emission control system and adjustments
- Warranty statement
- Emission-related installation instructions

ENGINE PARTS AND / OR EQUIPMENT RELATED TO CARB EXHAUST EMISSION REGULATIONS.

Parts which are mandatory for engine operation.

The following parts as manufactured according to HATZ specifications are mandatory for engine operation which meets CARB exhaust emission regulations.

- Fuel injector
- Fuel injection pump
- Bimetalic Strip
- Intake manifold
- Exhaust manifold
- Crankcase breather valve

- Oil filler Cap
- Intake and exhaust gaskets at head interfaces
- Emission Control Information Labels

Only parts manufactured by Hatz and which have passed the Hatz Quality Assurance Program are assured of meeting CARB exhaust emission regulations.

UNUSUAL OPERATING CONDITIONS.

The engine must not be operated at a load factor less than 25 % for an extended period as such operation will cause the fuel injector to foul. If such a condition occurs, you should contact the nearest HATZ authorized Service Center for necessary repairs.

The engine is designed and adjusted to operate most efficiently at the following conditions:

- Air temperature of 25° C (77° F)
- Atmospheric pressure of 100 kPa (14.5 psi)
- Relative humidity of 30 %

Operation of the engine at conditions other than above will affect performance and exhaust emissions. Normally the equipment manufacturer takes this into account during the design of the machine and your equipment will perform within specifications over a wide range of climatic conditions. However if you must operate your equipment under very unusual climatic conditions, please contact your nearest Hatz distributor for advice.

MAINTENANCE SCHEDULE-CARB-RELATED PARTS.

The following minimum intervals are being adopted for adjustment, cleaning, repair, or replacement of following components:

At 1,500 hours, and 1,500 hours intervals thereafter:

- Fuel injector tips (cleaning only)

At 3,000 hours, and 3000 hours intervals thereafter:

- Fuel Injectors

The exhaust quality of engines can be influenced by the execution (the quality of execution) of above described maintenance work.

Therefore, the maintenance work has to be carried out by a qualified workshop.
Hatz authorised workshops, for example, are qualified workshops.
Hatz Diesel of America will give you respective addresses, if required.

EMISSION CONTROL SYSTEM AND ADJUSTMENTS.

The emission control system for this engine is EM (Engine Modification).
No adjustments are needed or possible.

CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT.
YOUR WARRANTY RIGHTS AND OBLIGATIONS.

The **California Air Resources Board** and Motorenfabrik Hatz GmbH & Co. KG are pleased to explain the **emission control system warranty** on your **2008 and later** engine. In California, new heavy-duty off-road engines must be designed, built, and equipped to meet the State's stringent anti-smog standards. The Motorenfabrik Hatz GmbH & Co. KG must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel-injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, the Motorenfabrik Hatz GmbH & Co. KG will repair your heavy-duty off-road engine at no cost to you including diagnosis, parts, and labor.

MANUFACTURER'S WARRANTY COVERAGE.

The 2008 and later heavy-duty off-road engines are warranted for **1500 hours of operation or two years of use, whichever first occurs.**
If any emission-related part on your engine is defective, the part will be repaired or replaced by Motorenfabrik Hatz GmbH & Co. KG.

OWNER'S WARRANTY RESPONSIBILITIES.

- As the heavy-duty off-road engine owner, you are responsible for the performance of the **required maintenance listed in your owner's manual**.
  Motorenfabrik Hatz GmbH & Co. KG recommends that you retain all receipts covering maintenance on your heavy-duty off-road engine, but Motorenfabrik Hatz GmbH & Co. KG cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

- As the heavy-duty off-road engine owner, you should however be aware that Motorenfabrik Hatz GmbH & Co. KG may deny you warranty coverage if your heavy-duty off-road engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

- Your engine is designed to operate on low sulfur diesel fuel or ultra-low sulfur diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with California's emissions requirements.

- You are responsible for initiating the warranty process. The ARB suggests that you present your heavy-duty off-road engine to a Motorenfabrik Hatz authorised dealer as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible.

If you have any questions regarding your warranty rights and responsibilities, you should contact Hatz Diesel of America, Inc. at **(262)-544-0254**.

HATZ DIESEL SUPPLEMENTAL WARRANTY FOR 2008 AND LATER CALIFORNIA CERTIFIED OFF-ROAD COMPRESSION-IGNITION ENGINES.

PARTS WITH SUPPLEMENTAL LIMITED WARRANTY.

The following limited warranty is supplemental to the standard HATZ DIESEL LIMITED ENGINE WARRANTY and covers 2008 and later California certified off-road compression-ignition engines and applies to the following exhaust emission-related components:

- Fuel injector
- Fuel injection pump
- Bimetalic Strip
- Intake manifold
- Exhaust manifold
- Crankcase breather valve
- Oil filler Cap
- Intake and exhaust gaskets at head interfaces
- Oil pressure switch
- Electric starter with wiring harnesses (optional)
- Sealing gaskets for exhaust muffler
- Sealing gaskets for air filter housing
- Emission Control Information Labels

SUPPLEMENTAL LIMITED WARRANTY.

Hatz Diesel of America, Inc. hereinafter referred to as "HATZ" warrants each of the above-listed parts when installed in a new engine sold by Hatz to be free from defects in material and workmanship under normal use and service, for a period of twenty-four (24) months after the date of delivery to the original retail purchaser and Hatz will at their option, repair or replace at Hatz's sales headquaters, or at a point designated by Hatz, any part or parts which shall appear to the satisfaction of Hatz upon inspection at such point, to have been defective in material or workmanship.

- Any warranted part which is scheduled for replacement as required maintenance is warranted for the period of time up to the first scheduled replacement point for that part.

- Any replacement part which is equivalent in performance and durability may be used in non-warranty maintenance or repairs and will not reduce the overall engine warrranty obligations of Hatz. However, Hatz is not responsible for failure of such replacement parts or failure of any other parts directly caused by failure of such replacement parts.

- This warranty does not obligate Hatz to bear any transportation charges in connection with the repair or replacement of defective parts. This warranty is transferrable to subsequent owners within the original twenty-four (24) months time period.

- In order to obtain service under this warranty, the retail purchaser should contact Hatz Diesel of America, Inc. at (262)-544-0254 for information and the nearest service center. The retail purchaser will not be charged for diagnostic labor which leads to the determination that a warranted part is defective, nor for the repair or replacement of warranted parts if the work is performed at an authorized Hatz service center. If other engine components are damaged due to a failure of the above-listed warranted parts still under warranty, these other engine components will also be repaired or replaced at no charge.

- This warranty shall not apply to any engine which shall have been installed or operated in a manner not recommended by Hatz, nor to any engine which shall have been repaired, altered, neglected, or used in any way which, in the opinion of Hatz, adversely affects its performance, nor to any engine in which parts not authorized by Hatz have been used, which parts or the use of which have damaged or caused defects in or otherwise adversely affected the engine or its performance, nor to normal maintenance service or replacement of normal service items.

Hatz reserves the right to modify, alter, and improve any engine or parts without incurring any obligation to replace any engine or parts previously sold with such modified, altered, or improved engine or parts.

EMISSION-RELATED INSTALLATION INSTRUCTIONS

“Failing to follow these instructions when installing a certified engine in a piece of nonroad equipment violates federal law (40CFR1068.105(b)), subject to fines or other penalties as described in the Clean Air Act.”

“If you install the engine in a way that makes the engine's emission control information labels hard to read during normal engine maintenance, you must place duplicate labels on the equipment.”

EQUIPMENT-LABELLING REQUIREMENTS: FUEL LABEL (Chapter 3.5)

The fuel label has to be permanently attached to the equipment.
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INSTRUCTIONS ON THE INSTALLATION OF THE EXHAUST SYSTEM

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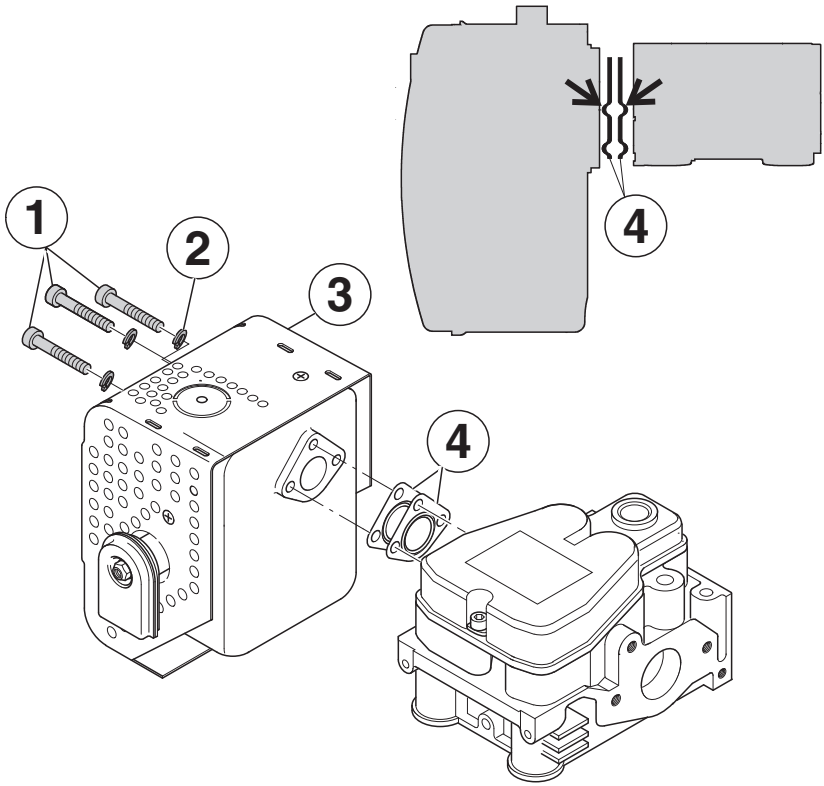

Exhaust-silencers and protection guard

The exhaust silencer is fitted in connection with flat washers.
Fixation is done by Allen screws.

Dismantling:
- Remove in numerical sequence **1...4**.

Assembly:
- Assemble in reverse sequence.

- Ensure gasket-kit is fitted in correct sequence i.e. the creased gaskets **4** face towards exhaust silencer and cylinder head.

SAMPLING OF EXHAUST EMISSIONS

After the engine is installed in the equipment and placed in service, the sampling of exhaust emissions can be performed in a way that prevents diluting the exhaust sample with ambient air as follows:

- Remove the exhaust mesh insert, if so fitted, as described in chapter 5.3.5.

- The sampling probe for measuring the emissions can be put into the exhaust silencer outlet. There are no additional pipes or clamps needed for measuring the undiluted exhaust sample.

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.